**CENTRAL KENYA NATIONAL SCHOOLS JOINT MOCK - 2016**
**233/3**
**CHEMISTRY**
**PAPER 3**
**(PRACTICAL)**
**JULY/AUGUST, 2016**
**TIME: 2¼ HOURS**

1. You are provided with:
- Acid A labelled solution A.
- 2.0M sodium hydroxide solution labelled solution B.
- Solution C containing 25.0g per litre of an alkanoic acid.

You are required to:
(a) Prepare a dilute solution of sodium hydroxide, solution B.
(b) Determine the:
(i) molar mass of the alkanoic acid.
(ii) reaction ratio between sodium hydroxide and acid A.

**PROCEDURE I**
Using a pipette and a pipette filler, place 25.0cm³ of solution B into a 250.0ml volumetric flask. Add about 200cm³ of distilled water. Shake well. Add more distilled water to make up to the mark. Label this solution D. Retain the remaining solution B for use in Procedure **II**.

Fill a burette with solution C. Using a clean pipette and a pipette filler, place 25.0cm³ of solution D into a 250ml conical flask. Add two drops of phenolphthalein indicator and titrate with solution C. Record your results in table 1. Repeat the titration two more times and complete the table.

| **Table I** | I | II | III |
|---|---|---|---|
| Final burette reading (cm³) | | | |
| Initial burette reading (cm³) | | | |
| Volume of solution C (cm³) added | | | |

Determine the:
(i) Average volume of solution C used. (1mk)
(ii) Concentration of solution D in moles per litre. (1mk)
(iii) Concentration of the alkanoic acid in solution C in moles per litre
(1 mole of the acid reacts with 3 moles of the base). (1mk)
(iv) Molar mass of the alkanoic acid. (1mk)

**PROCEDURE II**
Fill a clean burette with solution A. Place 5cm³ of solution A into a 100ml beaker.
Measure the initial temperature of solution A in the beaker and record it in table **II**.
Using a 10ml or a 100ml measuring cylinder, measure 25cm³ of solution B.
Add it to solution A in the beaker and immediately stir the mixture with the thermometer. Record the maximum temperature reached in table **II**. Repeat the experiment with other sets of volumes of solutions A and B and complete the table.

**Table II**

| Volume of solution A (cm³). | 5 | 9 | 13 | 17 | 21 | 25 |
|---|---|---|---|---|---|---|
| Volume of solution B (cm³). | 25 | 21 | 17 | 13 | 9 | 5 |
| Maximum temperature (°C). | | | | | | |
| Initial temperature (°C). | | | | | | |
| Change in temperature, ΔT. | | | | | | |

(6mks)

(a) On the grid provided, plot a graph of ΔT (Vertical axis) against the volume of solution A. (3mks)
(b) From the graph, determine the volume of solution A which gave the maximum change in temperature. (1mk)
(c) Determine the volume of solution B that reacted with the volume of solution A in (b) above. (1mk)
(d) Calculate the:
(i) ratio between the volumes of solution A and B that neutralized one another. (1mk)
(ii) concentration in moles per litre of the acid in solution A.
(Assume that the volume ratio is the same as the mole ratio). (1mk)

2. (a) You are provided with a solid X. Carry out the tests that follow.
Write your observations and inferences.
(i) Place half a spatula endful of solid X in a clean dry test tube. Heat gently and then strongly until no further change.

| Observations | Inferences |
|---|---|
| (1mk) | (1mk) |

(ii) Dissolve the remaining solid X in about 10cm³ of distilled water.

Divide the solution into four portions.

I To the first portion, add 2M sodium hydroxide solution drop wise until in excess.

| Observations | Inferences |
|---|---|
| (1mk) | (1mk) |

II To the second portion, add 2M ammonia solution dropwise until in excess.

| Observations | Inferences |
|---|---|
| (1mk) | (1mk) |

III To the third portion, add 3 to 4 drops of sodium chloride.

| Observations | Inferences |
|---|---|
| (1mk) | (1mk) |

IV To the fourth portion, add three drops of acidified Barium chloride solution.

| Observations | Inferences |
|---|---|
| (1mk) | (1mk) |

3. You are provided with a solid F. Carry out the following tests and record your observations and inferences in the spaces provided.

(a) Take one half a spatula end full in a clean spatula and ignite in a non luminous flame.

| Observations | Inferences |
|---|---|
| (1mk) | (½mk) |

(b) Place all the remaining solid F in a dry test tube. Add about 10cm³ of distilled water and shake the mixture. (Retain the mixture for use in tests (c), (d) and (e).

| Observations | Inferences |
|---|---|
| (½mk) | (1mk) |

(c) Using 2cm³ of the mixture obtained in (b) above, determine the pH of the mixture.

| Method | Observations | Inferences |
|---|---|---|
| | (1½mks) | (½mk) |

(d) To 2cm³ of the mixture obtained in (b) above, add all the sodium hydrogen carbonate provided.

| Observations | Inferences |
|---|---|
| (1mk) | (1mk) |

(e) To 2cm³ of the mixture obtained in (b) above, add three drops of acidified potassium dichromate (VI).

| Observations | Inferences |
|---|---|
| (1mk) | (1mk) |

23. (a) Add a sample of each to $Na_2CO_3$ ✓½ in separate test tubes.
There is effervescence ✓½ in one with $CH_3CH_2COOH$ but no effervescence ✓½ in the one with $CH_3CH_2CH_2OH$. ✓½
(b) Add 3 drops of H+/KMnO4 to a sample of each in a test tube; purple colour is decolourised in $CH_3CH_2CH_2OH$ and purple colour remains in $CH_3CH_2COOH$.
(c) Add 3 drops of $H^+/K_2Cr_2O_7$ to a sample of each in a test tube; in $CH_3CH_2CH_2OH$, orange colour turns to green but in $CH_3CH_2COOH$, orange colour is retained.

24. (a) Add the colourless liquid to:
- Anhydrous copper (II) sulphate which changes colour from white to blue.
- Anhydrous cobalt (II) chloride which changes colour from blue to pink.
- Any one collect.

(b) - Determine its boiling point which is 100°C or freezing point which is O°C.
- Determine its refractive index.
- Determine its density which is $1g/cm^3$

25. (a) Copper pyrite.
(b) $CuFeS_{2(S)} + 4O_{2(g)} \rightarrow 3SO_{2(g)} + 2FeO_{(S)} + Cu_2S_{(S)}$
(d) - Making cooking utensils.
- Making electrical wires.
- Making coins and ornaments.
- Making roofing sheets.
- Making alloys.

26. (i) $CO_{2(g)} + C_{(S)} \rightarrow 2CO_{(g)}$
(ii) Carbon (II) oxide – reducing agent.

26. Used as an oxidizing agent ✓½ in the preparation of $Cl_{2(g)}$ while used as a catalyst ✓½ in the preparation of oxygen.
Any 1 correct ✓²

28. (i) Both group 1 and (ii) elements results by losing electrons. ✓½
- Alkaline earth metals have move protons hence attract their electrons more ✓½ than the alkali metals and therefore cannot donate them readily.

(ii) - As you move down group 1, the no of energy levels increases making electrons in the outermost energy level to become loosely attracted to the nucleus hence easily host.
- In group (VII) elements reacts by gaining electrons. As an electron is entering the outermost energy level, it is repelled ✓½ by the electrons already there. As we go down the group, the energy levels increase hence repulsion/shielding effect increases.

29. (a) $SO^{2-}_4$
(b) $Ba^{2+}_{(aq)} + SO^{2-}_4 \rightarrow BaSO_{4(S)}$
(c) $\left[Zn(NH_3)_4\right]^{2+}_{(aq)}$